**Extra Practice**

### Chapter 1 • Skills Practice

**Lesson 1-1**

1. Let \( f(x) \) be the indicated transformation of \( f(x) = x^2 \). Write the rule for \( g(x) \).

2. Graph the function and describe what transformation of the parent function it represents.

3. Perform the given translation on the point \((-3, 4)\). Give the coordinates of the translated point.

4. Write the following information for Exercises 4 and 5.

5. Write the rule for \( g(x) \).

6. Let \( f(x) \) be the indicated transformation of \( f(x) = x^2 \). Write the rule for \( g(x) \).

7. Make a scatter plot using distance as the independent variable. Draw the line of best fit.

### Lesson 1-2

1. Let \( f(x) = \sqrt{x} \). Write the rule for \( g(x) \).

2. Make a scatter plot of the data with size as the independent variable. Find the line of best fit. Draw the line of best fit on your scatter plot.

3. The table below shows the distances from four planets to the Sun and the time it takes for each planet to complete its revolution around the Sun. Graph the data. Make a scatter plot of the data with size as the independent variable. Find the line of best fit. Describe the transformation.

### Lesson 1-3

1. Graph the data from the table. Describe the parent function and the transformation that best approximates the data set. Explain the correlation coefficient and the equation of the line of best fit. Draw the line of best fit on your scatter plot.

### Lesson 1-4

1. Graph the data from the table. Describe the parent function and the transformation that best approximates the data set. Explain the correlation coefficient and the equation of the line of best fit. Draw the line of best fit on your scatter plot.

### Lesson 1-4

1. \( f (x) = \frac{1}{2} x \) is a function of mass. Then use your graph to describe the change in the total cost of renting shoes per game. As part of a promotion, the alley lowers the price of shoes to $2.75 per game. What kind of transformation describes the change in the total cost of bowling games per person? (Lesson 1-3)

2. Draw the line of best fit on your scatter plot.

### Lesson 1-5

1. Graph the function and describe what transformation of the parent function it represents.

2. Let \( f(x) = \sqrt{x} \). Write the rule for \( g(x) \).

### Lesson 1-6

1. **Astronomy** The table below shows the distances from four planets to the Sun and the time it takes each of the other teams one time during a season. Graph the relationship between the number of teams and the total number of games and identify which parent function best describes the data. Then use the graph to estimate the total number of games per season when there are 8 teams in the league. (Lesson 1-2)

**Large Screen Televisions**

<table>
<thead>
<tr>
<th>Size (in.)</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>1196</td>
</tr>
<tr>
<td>50</td>
<td>1582</td>
</tr>
<tr>
<td>60</td>
<td>2092</td>
</tr>
<tr>
<td>70</td>
<td>2590</td>
</tr>
</tbody>
</table>

**Careers** Use the following information for Exercises 4 and 5.

1. At a spa each masseur earns $80 per day plus $15 per massage. Starting next month, the masseur plan will be changed to $100 plus $15 per massage. Write the new function to represent the original earnings structure. (Lesson 1-3)

2. Describe the transformation.
Extra Practice

Graph each function using a table. See Additional Answers.

1. \( f(x) = \frac{1}{x} \) 4. \( g(x) = \sqrt{x - 5} \)
2. \( f(x) = 2x^2 - 3x \) 5. \( g(x) = -x^2 + 2 \)
3. \( f(x) = x^3 - 2x \) 6. \( g(x) = \sqrt{x + 1} \)

Use the descriptions to write each quadratic function in vertex form.

7. The parent function \( f(x) = x^2 \) is vertically stretched by a factor of 3 and translated 5 units right to create \( g(x) = 3(x - 5)^2 \).
8. The parent function \( f(x) = x^2 \) is reflected over the x-axis and translated 12 units down to create \( g(x) = -x^2 - 12 \).

Identify the axis of symmetry for each function.

9. \( f(x) = 2x^2 - 1 \) 10. \( f(x) = (x + 2)^2 - 5 \)

For each function, determine whether the graph opens upward or downward, find the vertex, and find the y-intercept.

11. \( f(x) = -x^2 + 3 \) 12. \( f(x) = 2x^2 - 4x + 3 \)

Solve each equation.

13. \( 2x^2 - 5x - 3 = 0 \) 14. \( 3x^2 + 7x - 6 = 0 \)

Find the zeros of each function by factoring.

15. \( f(x) = x^2 - 9 \) 16. \( f(x) = x^2 - 4x + 3 \)

Use the following information for Lesson 2-3.

1. A student's science fair project is modeled by \( f(x) = x^2 - 4x + 5 \). How far has the student traveled horizontally when it reaches its maximum height?

2. A student's model is incorrect. Which of the following could be the student's model?

Extra Practice

Express each number in terms of \( i \).

25. \( 21 - 8i \) 26. \( -23 \) 27. \( 5 + 7i \) 28. \( -3 - 4i \)
29. \( 6 + 10i \) 30. \( 12 - 5i \) 31. \( -4 + 9i \) 32. \( 7 - 6i \)
33. \( -8 + i \) 34. \( 10 - 3i \) 35. \( 3 + 7i \) 36. \( -5 - 2i \)

Solve each equation.

37. \( x^2 + 6x + 9 = 0 \) 38. \( x^2 - 5x + 6 = 0 \)
39. \( x^2 + 4x + 4 = 0 \) 40. \( x^2 - 12x + 36 = 0 \)

Find the area of each function.

41. \( f(x) = -x^2 + 7x - 10 \) 42. \( f(x) = 2x^2 + 5x - 3 \)
43. \( f(x) = x^2 - 9 \) 44. \( f(x) = x^2 - 4x + 4 \)

Extra Practice

Graph each function by using the standard form of a quadratic function.

53. \( f(x) = x^2 + 4x + 20 \) 54. \( f(x) = x^2 - 5x + 6 \)
55. \( f(x) = x^2 - 2x + 4 \) 56. \( f(x) = x^2 - 3x + 9 \)
57. \( f(x) = x^2 - 3x - 4 \) 58. \( f(x) = x^2 - 2x + 7 \)

Find the type and number of solutions for each equation.

59. \( x^2 + 4x + 5 = 0 \) 60. \( x^2 - 6x + 8 = 0 \)
61. \( x^2 - 2x + 1 = 0 \) 62. \( x^2 + 4x - 5 = 0 \)

Graph each function by using the standard form of a quadratic function.

64. \( f(x) = x^2 - 4x + 3 \) 65. \( f(x) = x^2 + 3x + 2 \)
66. \( f(x) = x^2 - 2x + 1 \) 67. \( f(x) = x^2 + 4x - 4 \)

Determine whether each data set could represent a quadratic function. Explain.

72. \( (1, 2), (2, 9), (3, 18) \) 73. \( (1, 2), (2, 7), (3, 12) \)
74. \( (1, 2), (2, 7), (3, 12) \) 75. \( (1, 2), (2, 7), (3, 12) \)

Graph each quadratic function that fits each set of points.

78. \( (2, 10), (2, 2), (3, 5) \) 79. \( (2, 10), (2, 2), (3, 5) \)
80. \( (2, 10), (2, 2), (3, 5) \) 81. \( (2, 10), (2, 2), (3, 5) \)

Graph each quadratic function that fits each set of points.

82. \( (2, 10), (2, 2), (3, 5) \) 83. \( (2, 10), (2, 2), (3, 5) \)
84. \( (2, 10), (2, 2), (3, 5) \) 85. \( (2, 10), (2, 2), (3, 5) \)

Graph each quadratic function that fits each set of points.

86. \( (2, 10), (2, 2), (3, 5) \) 87. \( (2, 10), (2, 2), (3, 5) \)
88. \( (2, 10), (2, 2), (3, 5) \) 89. \( (2, 10), (2, 2), (3, 5) \)

Write a quadratic function that fits each set of points.

90. \( (2, 10), (2, 2), (3, 5) \) 91. \( (2, 10), (2, 2), (3, 5) \)
92. \( (2, 10), (2, 2), (3, 5) \) 93. \( (2, 10), (2, 2), (3, 5) \)

Write a quadratic function that fits each set of points.

94. \( (2, 10), (2, 2), (3, 5) \) 95. \( (2, 10), (2, 2), (3, 5) \)
96. \( (2, 10), (2, 2), (3, 5) \) 97. \( (2, 10), (2, 2), (3, 5) \)

Write a quadratic function that fits each set of points.

98. \( (2, 10), (2, 2), (3, 5) \) 99. \( (2, 10), (2, 2), (3, 5) \)
100. \( (2, 10), (2, 2), (3, 5) \) 101. \( (2, 10), (2, 2), (3, 5) \)
Extra Practice

Chapter 3: Skills Practice

Section 3-1
1. Identify the degree of each monomial.
2. Write each polynomial in standard form. Then identify the leading coefficient, degree, and number of terms. Name the polynomial.  
3. Write an equation that models each situation.
4. Solve each equation. 

Section 3-2
1. Write each polynomial in standard form. Then identify the degree, number of terms, factor, or root. 
2. Use the leading coefficient to order the polynomials from least to greatest degree. 
3. Graph each function on a calculator. Describe the graph. 
4. Determine whether the given binomial is a factor of the polynomial. 

Section 3-3
1. Use the following information to solve for each variable. 
2. Graph each function on a calculator. Describe the graph. 
3. Solve each equation. 
4. Find the zeros of the function. What do they represent?

Section 3-4
1. Write a polynomial function with the given zeros.  
2. Write the simplest polynomial function with the given zeros.  
3. Identify the leading coefficient, degree, and end behavior. 

Section 3-5
1. Determine whether the function graphed has an odd or even degree and a positive or negative leading coefficient. 
2. Identify the end behavior of the graph. 

Section 3-6
1. Solve each equation. 
2. Write each function that transforms f(x) = x^3 - 2x + 1 in each of the following ways. 
3. Write a quadratic function that has the same y-intercept and vertex as f(x) = x^2 - 4x + 5. 
4. Write a polynomial that has the same y-intercept and vertex as f(x) = x^2 - 4x + 5. 

Chapter 3: Applications Practice

Manufacturing

1. Write a function to model the capacity of the factory. 
2. Identify the maximum production capacity. 

Business

1. Write an equation that models the revenue. 
2. Determine the break-even point. 

Entertainment

1. Write an equation that models the number of people. 
2. Determine the number of people who paid for the concert. 

Sports

1. Write an equation that models the number of tickets sold. 
2. Determine the number of people who attended the game. 

Investing

1. Write an equation that models the growth of the stock. 
2. Determine the maximum value of the stock. 
3. Determine the value of the stock at the end of the year.

School

1. Write an equation that models the number of tickets sold. 
2. Determine the maximum number of tickets sold. 
3. Determine the number of tickets sold at the end of the year. 
4. Determine the number of tickets sold at the end of the year. 

Government

1. Write an equation that models the number of people who voted. 
2. Determine the number of people who voted. 
3. Determine the number of people who voted. 
4. Determine the number of people who voted. 

Food

1. Write a function that models the growth of the population. 
2. Determine the maximum number of people. 
3. Determine the number of people who voted. 
4. Determine the number of people who voted. 

Sports

1. Write a function that models the growth of the population. 
2. Determine the maximum number of people. 
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**Extra Practice**

**Lesson 1**

1. **Tell whether the function shows growth or decay. Then graph.**
   1. \( f(x) = 12 \cdot 4^x \) growth
   2. \( f(x) = 3 \cdot 5^{2x} \) decay

**Lesson 2**

1. **Explain whether each function is exponential.** See Additional Answers.
   1. \( f(x) = 4^x \)
   2. \( f(x) = 2x^3 \)
   3. \( f(x) = 10^{-x} \)
   4. \( f(x) = 10^{5x} \)

**Lesson 3**

1. **Graph the relation and connect the points. Then graph the inverse. Identify the domain and range of each relation.**
   1. \( x: -4, 0, 1, 5 \quad y: -2, 0, 3, 7 \)

**Lesson 4**

1. **Tell whether the function shows growth or decay. Then graph.**
   1. \( f(x) = 4^x \)
   2. \( f(x) = 2x^3 \)
   3. \( f(x) = 10^{-x} \)
   4. \( f(x) = 10^{5x} \)

**Lesson 5**

1. **Graph the relation and connect the points. Then graph the inverse. Identify the domain and range of each relation.**
   1. \( x: -4, 0, 1, 5 \quad y: -2, 0, 3, 7 \)

**Lesson 6**

1. **Tell whether the function shows growth or decay. Then graph.**
   1. \( f(x) = 4^x \)
   2. \( f(x) = 2x^3 \)
   3. \( f(x) = 10^{-x} \)
   4. \( f(x) = 10^{5x} \)

**Lesson 7**

1. **Graph the relation and connect the points. Then graph the inverse. Identify the domain and range of each relation.**
   1. \( x: -4, 0, 1, 5 \quad y: -2, 0, 3, 7 \)

**Exercise 4-6**

1. **Tell whether the function shows growth or decay. Then graph.**
   1. \( f(x) = 12 \cdot 4^x \) growth
   2. \( f(x) = 3 \cdot 5^{2x} \) decay

**Exercise 4-8**

1. **Tell whether the function shows growth or decay. Then graph.**
   1. \( f(x) = 4^x \)
   2. \( f(x) = 2x^3 \)
   3. \( f(x) = 10^{-x} \)
   4. \( f(x) = 10^{5x} \)

**Exercise 5-3**

1. **Tell whether the function shows growth or decay. Then graph.**
   1. \( f(x) = 4^x \)
   2. \( f(x) = 2x^3 \)
   3. \( f(x) = 10^{-x} \)
   4. \( f(x) = 10^{5x} \)

**Exercise 5-4**

1. **Tell whether the function shows growth or decay. Then graph.**
   1. \( f(x) = 4^x \)
   2. \( f(x) = 2x^3 \)
   3. \( f(x) = 10^{-x} \)
   4. \( f(x) = 10^{5x} \)

**Exercise 5-5**

1. **Tell whether the function shows growth or decay. Then graph.**
   1. \( f(x) = 4^x \)
   2. \( f(x) = 2x^3 \)
   3. \( f(x) = 10^{-x} \)
   4. \( f(x) = 10^{5x} \)

**Exercise 5-6**

1. **Tell whether the function shows growth or decay. Then graph.**
   1. \( f(x) = 4^x \)
   2. \( f(x) = 2x^3 \)
   3. \( f(x) = 10^{-x} \)
   4. \( f(x) = 10^{5x} \)

**Exercise 5-7**

1. **Tell whether the function shows growth or decay. Then graph.**
   1. \( f(x) = 4^x \)
   2. \( f(x) = 2x^3 \)
   3. \( f(x) = 10^{-x} \)
   4. \( f(x) = 10^{5x} \)

**Exercise 5-8**

1. **Tell whether the function shows growth or decay. Then graph.**
   1. \( f(x) = 4^x \)
   2. \( f(x) = 2x^3 \)
   3. \( f(x) = 10^{-x} \)
   4. \( f(x) = 10^{5x} \)

**Exercise 5-9**

1. **Tell whether the function shows growth or decay. Then graph.**
   1. \( f(x) = 4^x \)
   2. \( f(x) = 2x^3 \)
   3. \( f(x) = 10^{-x} \)
   4. \( f(x) = 10^{5x} \)
Extra Practice

Chapter 5

Skills Practice

Lesson 5-1

Given: y varies directly as x. Write and graph each direct variation function.
1. y = 5x when x = 3
2. y = 4x when x = 2
3. y = 6 when x = 3
4. y = 8 when x = 4
5. y = 3 when x = 6
6. y = 8 when x = 4

Determine whether each data set represents a direct variation, an inverse variation, or neither.
7. x | 1 | 2 | 3 | 4 | 5 | 6
   y | 3 | 6 | 9 | 12 | 15 | 18
8. x | 1 | 2 | 3 | 4 | 5 | 6
   y | 2 | 4 | 6 | 8 | 10 | 12
9. x | 1 | 2 | 3 | 4 | 5 | 6
   y | 0 | 0 | 0 | 0 | 0 | 0
10. x | 1 | 2 | 3 | 4 | 5 | 6
   y | 1 | 2 | 3 | 4 | 5 | 6

Lesson 5-2

Simplify. Identify any x-values for which the expression is undefined.
11. \( \frac{x}{x - 1} \) \( \frac{x}{x - 2} \), direct
12. \( \frac{x}{x - 1} + \frac{x}{x - 2} \), neither

Multiply or divide. Assume that all expressions are defined.
13. \( \frac{3x - 2}{x - 1} \div \frac{2x + 1}{x - 3} \)
14. \( \frac{3x - 2}{x - 1} \div \frac{2x + 1}{x - 3} \)
15. \( \frac{3x - 2}{x - 1} \div \frac{2x + 1}{x - 3} \)
16. \( \frac{3x - 2}{x - 1} \div \frac{2x + 1}{x - 3} \)
17. \( \frac{3x - 2}{x - 1} \div \frac{2x + 1}{x - 3} \)

Lesson 5-3

Find the least common multiple for each pair.
18. \( 6y \) and \( 2y^2 \)
19. \( 3x \) and \( 4x^2 \)
20. \( 5x^2 \) and \( 6x^3 \)
21. \( 3x^2 \) and \( 4x^2 \)
22. \( 2x^2 \) and \( 3x^3 \)
23. Add or subtract. Identify any x-values for which the expression is undefined.
24. \( \frac{1}{x - 3} \) + \( \frac{1}{x - 5} \)
25. \( \frac{1}{x - 3} \) + \( \frac{1}{x - 5} \)
26. \( \frac{1}{x - 3} \) + \( \frac{1}{x - 5} \)
27. \( \frac{1}{x - 3} \) + \( \frac{1}{x - 5} \)

Lesson 5-4

Using the graph of \( f(x) \) as a guide, describe the transformation and graph each function.
28. \( g(x) = f(x - 2) \)
29. \( g(x) = f(x - 2) \)
30. \( g(x) = f(x - 2) \)
31. \( g(x) = f(x - 2) \)

Lesson 5-5

Use the following information for Exercises 1 and 2.
A car salesman sells cars only at a square board. The total area of the board in square feet can be represented by the expression \( x^2 + 2x + 36 \).
32. \( x = 2, f(x) = 4 \)
33. \( x = 4, f(x) = 16 \)
34. \( x = 6, f(x) = 36 \)
35. \( x = 8, f(x) = 64 \)
36. \( x = 10, f(x) = 100 \)

Use the following information for Exercises 1 and 2.
A car salesman sells cars only at a square board. The total area of the board in square feet can be represented by the expression \( x^2 + 2x + 36 \).
37. \( x = 2, f(x) = 4 \)
38. \( x = 4, f(x) = 16 \)
39. \( x = 6, f(x) = 36 \)
40. \( x = 8, f(x) = 64 \)
41. \( x = 10, f(x) = 100 \)

Lesson 5-6

Solve each equation.
42. \( x - 2 = 5 \)
43. \( x - 2 = 5 \)
44. \( 2x - 3 = 5 \)
45. \( 2x - 3 = 5 \)
46. \( 2x - 3 = 5 \)
47. \( 2x - 3 = 5 \)
48. \( 2x - 3 = 5 \)
49. \( 2x - 3 = 5 \)
50. \( 2x - 3 = 5 \)

Lesson 5-7

Write each equation in radical form, and simplify.
51. \( \sqrt{9} = 3 \)
52. \( (-6)^2 = 36 \)
53. \( \sqrt{16} \)
54. \( \sqrt{25} = 5 \)
55. \( \sqrt{36} = 6 \)
56. \( \sqrt{49} = 7 \)
57. \( 

Extra Practice

Chapter 5

Applications Practice

1. Physics The amount of force F exerted by an object varies directly as the object's acceleration a. The object accelerates at \( 5 \text{ m/s}^2 \) and exerts a force of 10 Newtons. How much force would the object exert if it accelerates at an acceleration of \( 2 \text{ m/s}^2 \)?
2. Transportation The time it required for a bus to travel a certain distance varies inversely as its average speed. It takes the bus 2.5 h to travel between two cities at 10 km/h. How long would the same drive take at 40 km/h?

Recruitment The following information for Exercises 1 and 2.
A car salesman sells cars only at a square board. The total area of the board in square feet can be represented by the expression \( x^2 + 2x + 36 \).

1. If a data point is an outlier, what is the probability that it is due to chance rather than the true trend?
2. If a data point is an outlier, what is the probability that it is due to chance rather than the true trend?
3. If a data point is an outlier, what is the probability that it is due to chance rather than the true trend?
4. If a data point is an outlier, what is the probability that it is due to chance rather than the true trend?
5. Fitness Geoff runs a 6 mi race for charity. During the first 4 mi of the race, he averaged 5 mph. During the last 2 mi, he averaged 8 mph. What was Geoff’s average speed in miles per hour for the entire race? Round to the nearest hundredth.

School The following information for Exercises 1 and 2.
A science class is taking a field trip to the planetarium. Admissions are $4 per student, plus there is a tour charge of $80 per class.

1. Write and graph a function to represent the total average cost per field trip student if 25 students go on the field trip.
2. The period of a pendulum is the time it takes for the pendulum to complete one back-and-forth swing. The formula \( f = 2\pi \sqrt{\frac{L}{g}} \) gives the period \( f \) in seconds while \( g \) is the length of the pendulum in feet.

13. Geometry The length of a diagonal of a rectangular prism is given by \( d = \sqrt{l^2 + w^2 + h^2} \), where \( l \) is the length, \( h \) is the width, and \( w \) is the height. What is the minimum height in inches of a box with a length of 5 in, and a width of 2 in, that will hold a 20 in. ball? Round your answer to the nearest tenth.

14. Travel A tour boat travels 12 mi up a river and 12 mi down the river at a speed of 5.1 h. In still water, the boat travels at an average speed of \( 5 \text{ mph} \). Based on this information, what is the speed of the river's current?

15. Solve each distribution. Give the function a transformation of \( g(x) = T(x) \) left.

16. Geometry The length of a diagonal of a rectangular prism is given by \( d = \sqrt{l^2 + w^2 + h^2} \), where \( l \) is the length, \( h \) is the width, and \( w \) is the height. What is the minimum height in inches of a box with a length of 5 in, and a width of 2 in, that will hold a 20 in. ball? Round your answer to the nearest tenth.

17. Geometry The length of a diagonal of a rectangular prism is given by \( d = \sqrt{l^2 + w^2 + h^2} \), where \( l \) is the length, \( h \) is the width, and \( w \) is the height. What is the minimum height in inches of a box with a length of 5 in, and a width of 2 in, that will hold a 20 in. ball? Round your answer to the nearest tenth.

18. Geometry The length of a diagonal of a rectangular prism is given by \( d = \sqrt{l^2 + w^2 + h^2} \), where \( l \) is the length, \( h \) is the width, and \( w \) is the height. What is the minimum height in inches of a box with a length of 5 in, and a width of 2 in, that will hold a 20 in. ball? Round your answer to the nearest tenth.

19. Geometry The length of a diagonal of a rectangular prism is given by \( d = \sqrt{l^2 + w^2 + h^2} \), where \( l \) is the length, \( h \) is the width, and \( w \) is the height. What is the minimum height in inches of a box with a length of 5 in, and a width of 2 in, that will hold a 20 in. ball? Round your answer to the nearest tenth.

20. Geometry The length of a diagonal of a rectangular prism is given by \( d = \sqrt{l^2 + w^2 + h^2} \), where \( l \) is the length, \( h \) is the width, and \( w \) is the height. What is the minimum height in inches of a box with a length of 5 in, and a width of 2 in, that will hold a 20 in. ball? Round your answer to the nearest tenth.
Lesson 6-6

Exercise 16. Write a function to represent the cost of shipping costs for packages up to 10 lb.

Shipping Costs

<table>
<thead>
<tr>
<th>Weight (lb)</th>
<th>Rate ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 2</td>
<td>5.00</td>
</tr>
<tr>
<td>2 - 4</td>
<td>4.50</td>
</tr>
<tr>
<td>4 - 6</td>
<td>4.00</td>
</tr>
<tr>
<td>6 - 10</td>
<td>3.50</td>
</tr>
</tbody>
</table>

1. A state senator’s high approval rating is rising steadily but then drops sharply after a scandal.

2. The rates of an antique increase slowly.

3. Sales of a valuable stock dip and then recover.

4. The value of an antique chair increases steadily.

5. A state senator’s high approval rating is rising steadily but then drops sharply after a scandal.

6. The rates of an antique increase slowly.

7. Sales of a valuable stock dip and then recover.

8. The value of an antique chair increases steadily.

9. A state senator’s high approval rating is rising steadily but then drops sharply after a scandal.

10. The rates of an antique increase slowly.

11. Sales of a valuable stock dip and then recover.

12. The value of an antique chair increases steadily.

Exercise 17. Given f(x) and g(x), find:

- (f ∘ g)(x)
- (g ∘ f)(x)

1. f(x) = 2x + 3 and g(x) = x² - 1

2. f(x) = x³ - 2x² + 1 and g(x) = x - 3

Exercise 18. Use the horizontal-line test to determine whether the inverse of each relation is a function.

1. f(x) = x²

2. g(x) = 2x + 3

Exercise 19. Find the inverse of each function. Determine whether the inverse is a function, and state its domain and range.

1. f(x) = x + 2

2. g(x) = x - 3

Exercise 20. Determine by composition whether each pair of functions are inverses.

- f(x) = 2x + 3
- g(x) = x/2

Exercise 21. Find the horizontal asymptote(s) for each function.

1. f(x) = 1/x

2. g(x) = x³

Exercise 22. Find the vertical asymptote(s) for each function.

1. f(x) = 1/x

2. g(x) = x³

Exercise 23. Determine the domain and range of each function.

1. f(x) = 1/x

2. g(x) = x³

Exercise 24. Determine if each relation is a function. Nonlinear functions may require a graph or table.

1. f(x) = x²

2. g(x) = 2x + 3

Exercise 25. Find the difference: f(x) - g(x)

1. f(x) = x² and g(x) = x

2. f(x) = 2x + 3 and g(x) = x²

Exercise 26. Determine whether each given data set could be the graph of a function. Use the vertical-line test.

1. Data set:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

2. Data set:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Exercise 27. Determine whether the following pairs of functions are inverses.

1. f(x) = 2x + 3 and g(x) = x/2

2. f(x) = x² and g(x) = x

Exercise 28. Determine by composition whether each pair of functions are inverses.

1. f(x) = 2x + 3 and g(x) = x/2

2. f(x) = x² and g(x) = x

Exercise 29. Evaluate each function at the given value.

1. f(x) = 2x + 3 at x = 2

2. g(x) = x² - 1 at x = 3

Exercise 30. Evaluate each function at the given value.

1. f(x) = 2x + 3 at x = 2

2. g(x) = x² - 1 at x = 3

Exercise 31. Evaluate each function at the given value.

1. f(x) = 2x + 3 at x = 2

2. g(x) = x² - 1 at x = 3

Exercise 32. Determine whether each relation is a function.

1. Relation:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

2. Relation:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Exercise 33. Determine whether each relation is a function.

1. Relation:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

2. Relation:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Exercise 34. Determine whether each relation is a function.

1. Relation:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

2. Relation:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Exercise 35. Evaluate each function at the given value.

1. f(x) = 2x + 3 at x = 2

2. g(x) = x² - 1 at x = 3

Exercise 36. Evaluate each function at the given value.

1. f(x) = 2x + 3 at x = 2

2. g(x) = x² - 1 at x = 3

Exercise 37. Evaluate each function at the given value.

1. f(x) = 2x + 3 at x = 2

2. g(x) = x² - 1 at x = 3

Exercise 38. Determine whether each relation is a function.

1. Relation:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

2. Relation:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Exercise 39. Determine whether each relation is a function.

1. Relation:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

2. Relation:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Exercise 40. Determine whether each relation is a function.

1. Relation:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

2. Relation:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Exercise 41. Determine whether each relation is a function.

1. Relation:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

2. Relation:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Exercise 42. Determine whether each relation is a function.

1. Relation:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

2. Relation:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>
Extra Practice Chapter 7 • Skills Practice

1. When texting on a phone, press 2 a 3 times, D, E, or E. Pressing a 7 a times D, E, or F. How many messages are possible by pressing a 2, a 3, and then a 7?

2. At a company, each employee has an ID that consists of 5 digits followed by a letter. The letters Q and X are not used. How many employee IDs are possible?

3. If there are 8 finalists in a talent show, how many ways can a winner and a runner-up be chosen?

4. A limit soccer team has 10 members. How many ways can the coach choose a right forward, a center forward, and a left forward?

5. Enrich health club offers 7 types of aerobic classes. She plans to attend 4 classes this week. How many ways can she choose the 4 classes if all are different?

6. Francesca can take 4 of her 14 books on a trip. How many ways can she choose them?

Exercises 7-2

Two number cubes are rolled. Find each probability.

7. Both cubes roll the same number.

8. The sum is greater than 8.

9. Both cubes roll even numbers.

10. What is the probability that a randomly selected day in January is after the 20th?

Exercises 7-3

Find each probability.

11. The sum is 8 or less.

12. The sum is greater than 8.

13. The sum is even.

14. Both cubes have a 4.

15. The sum is less than 4.

16. What is the probability that a randomly selected day in January is after the 20th?

17. Both cubes are odd.

18. The sum is 5.

19. The sum is 11.

20. What is the probability that a randomly selected day in January is after the 20th?

Exercises 7-4

The table shows the results of a schoolwide survey on the homecoming dance. Find each probability.

21. Given that a point was scored by a free throw, what is the probability that Misha scored that point?

22. What is the probability that an immigrant did not find a job or returned to his or her country before the end of the study?

Exercises 7-5

A group of 100 immigrants was studied over a one-year period. During the study, 85 of the immigrants found jobs, and 14 returned to their country of origin. Of the immigrants who found jobs, 8 of them returned to their countries before the end of the study.

1. What is the probability that an immigrant found a job and at least one of the immigrants who found jobs returned to his or her country of origin?

2. What is the probability that an immigrant found a job but did not find a job or returned to his or her country of origin?


### Extra Practice

**Chapter 8**

**Skills Practice**

Find the mean, median, and mode of each data set. (Lesson 8-2)

1. {3, 7, 2, 4, 5}
2. {8, 4, 7, 3, 2, 12, 1}
3. {1, 2, 3, 6, 12, 10}
4. Find the expected value of the prize. (Lesson 8-3)

#### Extra Practice

#### Application Practice

**Basketball**

Use the following information for Exercises 1-5. The table below shows the number of points scored by Tracy McGrady and Yao Ming of the Houston Rockets during the same 5 games of the 2005 season. (Lesson 8-3)

<table>
<thead>
<tr>
<th>Game</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tracy McGrady</td>
<td>29</td>
<td>24</td>
<td>26</td>
<td>22</td>
<td>28</td>
</tr>
<tr>
<td>Yao Ming</td>
<td>25</td>
<td>27</td>
<td>29</td>
<td>24</td>
<td>26</td>
</tr>
</tbody>
</table>

1. Find the means of both sets of data. (Lesson 8-3)
2. Find the standard deviation of both sets of data. (Lesson 8-3)

#### Use the Binomial Theorem to expand each binomial. (Lesson 8-4)

1. $(x + 3)^2$
2. $(x + 3)^3$
3. $(x + 3)^4$
4. $(x + 3)^5$

1. Find the variance and standard deviation. (Lesson 8-5)

#### Quality Control

The manager of a book publisher has received a shipment of books from the printer. He wants to examine the 4-6. See Additional Answers.

### Chapter 8

**Skills Practice**

Classify each sample. (Lesson 8-6)

21. A survey shows that 38% of voters will vote for Tucci in an election, and that 64% will vote for Photo 1, and 47% will vote for Photo 3. The margin of error is ±5%.

22. Does reducing the fat in a particular recipe make it less appealing? (Lesson 8-7)

#### Use the Binomial Theorem to expand each binomial. See Additional Answers. (Lesson 8-8)

23. $(x + 3)^4$
24. $(x + 3)^5$

25. A tire manufacturer claims that one brand of tires will last 50,000 miles. In a random sample of 16 tires, the average increase in sales was 10.5% with a standard deviation of 4%. Find the standard deviation of both sets of data. (Lesson 8-8)

1. Determine whether the survey clearly projects the winner. Explain your response. (Lesson 8-8)

#### Classify each sampling method. Which is most representative? (Lesson 8-8)

1. A researcher compares incomes of people who live in rural areas with incomes of people who live in big cities. (Lesson 8-8)

#### Use the Binomial Theorem to expand each binomial. See Additional Answers. (Lesson 8-8)

23. $(x + 3)^4$
24. $(x + 3)^5$

25. A tire manufacturer claims that one brand of tires will last 50,000 miles. In a random sample of 16 tires, the average increase in sales was 10.5% with a standard deviation of 4%. Find the standard deviation of both sets of data. (Lesson 8-8)

1. Determine whether the survey clearly projects the winner. Explain your response. (Lesson 8-8)

#### Classify each sampling method. Which is most representative? (Lesson 8-8)

1. A researcher compares incomes of people who live in rural areas with incomes of people who live in big cities. (Lesson 8-8)

#### Use the Binomial Theorem to expand each binomial. See Additional Answers. (Lesson 8-8)

23. $(x + 3)^4$
24. $(x + 3)^5$
Extra Practice

Lesson 9-3

Write an explicit rule for the nth term of each sequence.

1. \(\frac{1}{1}, \frac{3}{2}, \frac{7}{4}, \frac{17}{8}, \ldots\)
2. \(\frac{2}{1}, \frac{2}{2}, \frac{2}{3}, \frac{2}{4}, \ldots\)
3. \(\frac{1}{2}, \frac{2}{4}, \frac{3}{8}, \frac{4}{16}, \ldots\)
4. \(\frac{1}{3}, \frac{2}{6}, \frac{3}{9}, \frac{4}{12}, \ldots\)

Determine whether each sequence could be arithmetic or geometric. If it is arithmetic, find the common difference. If it is geometric, find the common ratio.

5. \(1, 2, 4, 8, 16, 32, 64, \ldots\)
6. \(3, 6, 12, 24, 48, 96, \ldots\)
7. \(1, 3, 9, 27, 81, \ldots\)
8. \(2, 5, 11, 23, 47, \ldots\)

Determine whether each term of an arithmetic sequence is positive or negative.

9. \(a_1 = 10, d = -3\)
10. \(a_1 = -5, d = 2\)
11. \(a_1 = 0, d = 4\)
12. \(a_1 = -2, d = -1\)

Determine whether each term of a geometric sequence is positive or negative.

13. \(a_1 = 2, r = -3\)
14. \(a_1 = -1, r = 2\)
15. \(a_1 = -4, r = -1\)
16. \(a_1 = 3, r = -3\)

Find the 4th term of each arithmetic sequence.

17. \(a_1 = 2, d = 3\)
18. \(a_1 = 5, d = -2\)
19. \(a_1 = -1, d = 1\)
20. \(a_1 = 0, d = -4\)

Find the nth term of each arithmetic sequence.

21. \(a_1 = 5, d = 2\)
22. \(a_1 = -3, d = -1\)
23. \(a_1 = 3, d = -4\)
24. \(a_1 = -2, d = 1\)

Find the number of terms in each arithmetic sequence.

25. \(a_1 = 1, d = 3, n = 10\)
26. \(a_1 = 3, d = -1, n = 10\)
27. \(a_1 = -2, d = 2, n = 10\)
28. \(a_1 = 4, d = -1, n = 10\)

Find the indicated sum of each arithmetic sequence.

29. \(S_n = 10, a_1 = 3, n = 10\)
30. \(S_n = 15, a_1 = 5, n = 15\)
31. \(S_n = 20, a_1 = 2, n = 20\)
32. \(S_n = 25, a_1 = 3, n = 25\)

Determine whether each term of a geometric sequence is positive or negative.

33. \(a_1 = 1, r = 2\)
34. \(a_1 = -1, r = -2\)
35. \(a_1 = 2, r = 3\)
36. \(a_1 = -2, r = -3\)

Find the nth term of each geometric sequence.

37. \(a_1 = 2, r = 3, n = 5\)
38. \(a_1 = 3, r = 2, n = 6\)
39. \(a_1 = 4, r = 1, n = 7\)
40. \(a_1 = 5, r = -1, n = 8\)

Find the indicated sum of each geometric sequence.

41. \(S_n = 12, a_1 = 2, n = 3\)
42. \(S_n = 15, a_1 = 3, n = 4\)
43. \(S_n = 18, a_1 = 4, n = 5\)
44. \(S_n = 21, a_1 = 5, n = 6\)

Determine whether each term of an arithmetic series is positive or negative.

45. \(a_1 = 1, d = 2\)
46. \(a_1 = -1, d = -2\)
47. \(a_1 = 2, d = -1\)
48. \(a_1 = -2, d = 1\)

Find the sum of each arithmetic series.

49. \(S_n = 10, a_1 = 2, d = 3, n = 10\)
50. \(S_n = 15, a_1 = 3, d = 4, n = 15\)
51. \(S_n = 20, a_1 = 4, d = 5, n = 20\)
52. \(S_n = 25, a_1 = 5, d = 6, n = 25\)

Determine whether each term of a geometric series is positive or negative.

53. \(a_1 = 1, r = 2\)
54. \(a_1 = -1, r = -2\)
55. \(a_1 = 2, r = 3\)
56. \(a_1 = -2, r = -3\)

Find the sum of each geometric series.

57. \(S_n = 10, a_1 = 2, r = 3, n = 10\)
58. \(S_n = 15, a_1 = 3, r = 4, n = 15\)
59. \(S_n = 20, a_1 = 4, r = 5, n = 20\)
60. \(S_n = 25, a_1 = 5, r = 6, n = 25\)

Determine the sum of each arithmetic series.

61. \(S_n = 20\)
62. \(S_n = 30\)
63. \(S_n = 40\)
64. \(S_n = 50\)

Extra Practice

Lesson 9-4

Determine whether each sequence could be geometric or arithmetic. If so, find the common ratio.

1. \(a_1 = 1, a_2 = 3, a_3 = 9, \ldots\)
2. \(a_1 = 2, a_2 = 4, a_3 = 8, \ldots\)
3. \(a_1 = 3, a_2 = 6, a_3 = 12, \ldots\)
4. \(a_1 = 4, a_2 = 8, a_3 = 16, \ldots\)

Determine whether each term of an arithmetic sequence is positive or negative.

5. \(a_1 = 1, d = 2\)
6. \(a_1 = -1, d = -2\)
7. \(a_1 = 2, d = -1\)
8. \(a_1 = -2, d = 1\)

Find the sum of each arithmetic series.

9. \(S_n = 10, a_1 = 2, d = 3, n = 10\)
10. \(S_n = 15, a_1 = 3, d = 4, n = 15\)
11. \(S_n = 20, a_1 = 4, d = 5, n = 20\)
12. \(S_n = 25, a_1 = 5, d = 6, n = 25\)

Determine whether each term of a geometric series is positive or negative.

13. \(a_1 = 1, r = 3\)
14. \(a_1 = -1, r = -3\)
15. \(a_1 = 2, r = 4\)
16. \(a_1 = -2, r = -4\)

Find the sum of each geometric series.

17. \(S_n = 10, a_1 = 2, r = 3, n = 10\)
18. \(S_n = 15, a_1 = 3, r = 4, n = 15\)
19. \(S_n = 20, a_1 = 4, r = 5, n = 20\)
20. \(S_n = 25, a_1 = 5, r = 6, n = 25\)

Determine whether each term of an arithmetic series is positive or negative.

21. \(a_1 = 1, d = 2\)
22. \(a_1 = -1, d = -2\)
23. \(a_1 = 2, d = -1\)
24. \(a_1 = -2, d = 1\)

Find the sum of each arithmetic series.

25. \(S_n = 10, a_1 = 2, d = 3, n = 10\)
26. \(S_n = 15, a_1 = 3, d = 4, n = 15\)
27. \(S_n = 20, a_1 = 4, d = 5, n = 20\)
28. \(S_n = 25, a_1 = 5, d = 6, n = 25\)

Determine whether each term of a geometric series is positive or negative.

29. \(a_1 = 1, r = 3\)
30. \(a_1 = -1, r = -3\)
31. \(a_1 = 2, r = 4\)
32. \(a_1 = -2, r = -4\)

Find the sum of each geometric series.

33. \(S_n = 10, a_1 = 2, r = 3, n = 10\)
34. \(S_n = 15, a_1 = 3, r = 4, n = 15\)
35. \(S_n = 20, a_1 = 4, r = 5, n = 20\)
36. \(S_n = 25, a_1 = 5, r = 6, n = 25\)
3. Aviation A plane is flying at an altitude of 4080 ft. The pilot sights the runway of an airport at an angle of depression of 5°. To the nearest tenth of a mile, what is the horizontal distance from the plane to the runway? (Lesson 10-5)

2. Architecture Thomas stands 250 ft from the base of the Sears Tower in Chicago. His eye level is 175 ft above the ground, and he measures the angle of elevation to the top of the tower to be 84°. Based on this information, what is the height of the Sears Tower to the nearest meter? (Lesson 10-3)

1. Additional Answers

Hobbies Use the following information for Exercises 11 and 12. Andrew uses pieces of wood to build triangular picture frames. Determine the number of triangles he can cut using the given side and angle measurements. Then solve the triangles. Round to the nearest tenth. (Lesson 10-4)

11. a = 10.5 cm, b = 12 cm, m∠A = 60°

12. a = 16 cm, b = 13 cm, m∠A = 44°

13. Hiking Jane and Karen leave their campsite at the same time. Jane hikes due east at 3 mph. Karen heads due north at 4 mph. To the nearest tenth of a mile, what is the distance between the hikers after 1 hour? (Lesson 10-4)

14. A measure has a triangular window with sides measuring 6.1, 11.6, and 16.8 ft. What is the area of the window to the nearest square foot? (Lesson 10-4)
2. What is the period of the function? __________

3. As a cyclist rides her bike, the height in inches above the ground of one of the pedals is modeled by
\[ h(t) = 5 + 10 \sin \left( \frac{\pi}{2} t \right) \]
where \( h(t) \) is the height above the ground in inches, and \( t \) is the time in hours. What is the period of the function? __________

4. Graph the function \( g(t) = 10 - 5 \cos \left( \frac{\pi}{2} t \right) \) for \( 0 \leq t \leq 4 \).

5. What is the period of the function \( f(t) = 5 \cos \left( \frac{\pi}{2} t \right) \)? __________

6. Graph the function \( f(t) = 5 \cos \left( \frac{\pi}{2} t \right) \) for \( 0 \leq t \leq 4 \).

10. A 60° rotation about the origin

11. A 135° rotation about the origin

12. Write the following information for Exercises 10 and 11:

The horizontal component of the acceleration of an object sliding down a frictionless incline plane is \( a_x = 0 \) and \( a_y = 0 \), where \( a_x \) is the angle of the inclined plane and where acceleration is measured in meters per second per second. (Lesson 11-13)

13. Graph the function \( f(t) = 5 \cos \left( \frac{\pi}{2} t \right) \) for \( 0 \leq t \leq 4 \). For what angle does the object have the greatest acceleration in the horizontal direction? __________

14. The population of thousands of a species is modeled by
\[ P(t) = 1000 \left( \frac{e^{0.5t} - 1}{e^{0.5t} + 1} \right), \]
where \( t \) is the time in years. (Lesson 11-14)

15. The temperature in New York City during one day in the summer is modeled by
\[ T(t) = 60 + 3 \cos \left( \frac{\pi}{12} t \right), \]
where \( T \) is the temperature in degrees Fahrenheit and \( t \) is the time in hours after midnight. (Lesson 11-14)

20. \( f(x) = 2 \cos (\pi x) \), \( f(-1.87) = -2.38 \), \( f(-0.2) = 1.98 \)

21. \( f(x) = 1 - 2 \sin (\pi x) \), \( f(0.71) = -2.12 \), \( f(0.77) = 4.95 \)
**Extra Practice**

### Extra Practice Chapter 12 • Skills Practice

**Lesson 12-1**
1. $x^2 + 10x + 4 = 0$
2. $x^2 = 16$
3. $2x^2 = 18$
4. $x^2 + 3x + 2 = 0$
5. $2x^2 - 10x = 0$
6. $3x^2 - 18x + 27 = 0$

Find the coordinates of the focus. Possible answer: $(5, 3)$
7. Possible answer: $x = 2, y = 0$
8. Possible answer: $x = -2, y = 0$

### Extra Practice Chapter 12 • Applications Practice

**Lesson 12-2**
1. $2x^2 + 3x + 1 = 0$
2. $3x^2 - 2x - 5 = 0$
3. $x^2 - 4x + 4 = 0$
4. $x^2 - 6x + 9 = 0$

Find the coordinates of the foci. Possible answers: $(3, 0), (6, 0)$
5. Possible answer: $x = 2, y = 0$
6. Possible answer: $x = -2, y = 0$

**Lesson 12-3**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

**Lesson 12-4**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

**Lesson 12-5**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

**Lesson 12-6**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

**Lesson 12-7**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

**Lesson 12-8**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

### Extra Practice Chapter 12 • Skills Practice

**Lesson 12-9**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

**Lesson 12-10**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

**Lesson 12-11**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

**Lesson 12-12**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

### Extra Practice Chapter 12 • Applications Practice

**Lesson 12-13**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

**Lesson 12-14**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

**Lesson 12-15**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

**Lesson 12-16**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

**Lesson 12-17**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

**Lesson 12-18**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

**Lesson 12-19**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

**Lesson 12-20**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

**Lesson 12-21**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

**Lesson 12-22**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

**Lesson 12-23**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

**Lesson 12-24**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$

**Lesson 12-25**
1. $x^2 + y^2 = 16$
2. $x^2 = 4y$
3. $x^2 - 4y = 16$

Find the coordinates of the foci. Possible answer: $(0, 0)$
4. Possible answer: $x = 2, y = 0$
5. Possible answer: $x = -2, y = 0$